European Commission
Directorate General Enterprise & Industry

Europe INNOVA Thematic Workshop on "Lead Markets and Innovation" June 29th and 30th, 2006 Munich, Germany

Official Background Document

A. INTRODUCTION

This first Europe INNOVA Thematic Workshop aspires to explore the concept of lead markets, as proposed by the **Aho Report** on creating favourable market conditions for innovative products and services. The workshop brings together Europe INNOVA partners with other key stakeholders and experts in the field to openly discuss requirements for creating new market opportunities in Europe based on leading edge technologies. The discussions during the two days of the workshop will hopefully lead to concrete recommendations that can be used effectively by the Europe INNOVA partners and the European Commission for policy formulation. The focus of the discussion will be on the **identification of potential barriers to the introduction of leading edge** technologies and the needs to further develop the legal and regulatory framework in their anticipation.

B. THE CONCEPT OF "LEAD MARKETS"

Lead markets can be defined as new or emerging markets characterised by a wide adoption of state-of-the-art technologies and introduction of globally leading innovations; they lead the international diffusion of an innovation and set the global standards. Firms, governments and the favourable or not environment for the application of the specific innovations are the main actors influencing the potential development of a lead market. The prediction of **lead markets** was always of great interest for multinational firms for developing first market entries for new innovations but also for governments intending to promote international competitiveness of their domestic economies. As a result the role and nature of governmental support can be crucial.

Superior technological knowledge is not always at the origin of an international competitive advantage. Instead, a country also gains a competitive advantage due to the earlier –than other countries- adoption of a specific innovation. This country (or region) provides its national firms with a head start in producing, gathering marketing intelligence, securing the property rights of a globally successful innovation and setting up **regulatory conditions** that support the internationalisation of this innovation. For instance, the mass market for cellular mobile telephony emerged in the Nordic countries before a joint European cellular system became the world standard in mobile telephony. Denmark's success story in wind technology is also explained by the internationalisation of strict environmental policy instruments such as REFITs (renewable energy feed tariffs), an instrument that was first introduced in Denmark. The latter example demonstrates that regulation could be an important lead market factor.

C. THE SUCCESS FACTORS FOR THE CREATION OF LEAD MARKETS

The ability to transfer or internationalise a globally leading innovation outside the country first generated depends on a variety of factors: '*There are nation-specific demand and market conditions (market context)*[1] *that increase the possibility that an innovation design that is favoured nationally is subsequently adopted by other countries as well*'[2].

International diffusion of innovations happens when nationally preferred innovations compete to become globally dominant. Innovations can be exported more easily if the environment and market conditions of the other countries are similar to the market the innovation was designed for or features are included in an innovation design that make the design suitable for a variety of environments. The availability of favourable conditions to the specific innovation constitutes a serious basis for the development of a lead market. As a result, innovation is more likely to be adopted[3] in the country with the largest collateral assets stock. If other countries increase their stock of collateral assets over time to similar level, then innovation could be adopted widely.

This is very important in the case of Europe since different -for example- regulatory conditions exist among EU Members. Consequently, public intervention regarding regulation - in fields that require protection - should also proceed in directions that offer legal protection on the one hand, while providing sufficient freedom for economic and technical creativity on the other (e.g., telecommunications, health care, climate protection, environmental protection, consumer protection, energy, water supply etc.).

D. THE FIRM'S PERSPECTIVE

Companies are the carriers of the lead market concept and those that promote and "implement" it. The development of lead markets is based on their **capacity to internationalise market activities**. But why would companies enter or shape lead markets? The most important reason seems to be the potential generated demand (i.e. exports). Others could be "learning for the future" or "enter faster than somebody else". However, such international investment takes place in an environment of increased complexity and uncertainty and in countries with varied consumer behaviour and government regulation. It is important to note that larger exports do not really trigger the development of national markets in any country. Investment does not primarily go to the highest need but where the return on investment is optimal due to national legislation and government directives.

However, to reap the benefits of such developments **supportive actions may be needed**. Demand could be coordinated or aggregated to create sufficiently large orders to make

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[1] *As national market context we define the sources of stimuli for the adoption of an innovation design. This context includes demand preferences formed by tastes and conditions, budgets, relative prices, regulations, standards, human resources and other local externalities. In order to follow the country that first adopted the design, the stimuli for adopting the same innovation design must increase in other countries according to their nation specific attributes.*

[2] *Marian Beise and Hans George Gemunden, 'Lead markets and regulation: a framework for analysing the international diffusion of environmental innovations', Ecological Economics 52, 2004*

[3] *We talk about adoption and not generation of innovation simply because the generation of an idea does not imply that the national collateral assets exist to support its development.*

innovation worthwhile. Opportunities need to be opened up also for innovative SMEs. Human resources need to be channelled towards the new knowledge. Norms, regulations and wider understanding of the lead market concept should modernize customers and providers, to "intelligent" ones, who will be aware of the potential new solutions, and would further support the evolution of the lead market by providing new opportunities to drive innovation for both public procurement and private investment.

E. FROM LEADING EDGE TECHNOLOGIES TO NEW MARKETS

EU's Science and Research Commissioner **Janez Potocnik** highlighted in a recent discussion the need to create favourable market conditions for technology-intensive goods and services. *"Creating good framework conditions for European research and innovation is not sufficient if we don't have market demand for new technologies that meet economic opportunities and societal needs,"* he said.

But what are real chances for Europe to create new jobs and market opportunities building upon leading edge technologies? Beside technological excellence and a strong home market also strong industrial competences are needed to translate superior knowledge into concrete market success. Without companies capable to reach international markets and to create and satisfy mass market needs, the concept of lead markets offers no realistic industry policy perspective. During the **two parallel sessions of the workshop**, Europe INNOVA partners and other experts in the field are requested to discuss how to define and further develop the concept of lead markets to the specific areas of Space industry and Eco-innovation. The two specific areas have been selected due to their radical up scaling of technological and market importance.

F. THE CASE OF THE SPACE/AERONAUTICS INDUSTRY

According to the results of the first Sectoral Innovation Panel on Space/Aeronautics the major driver of the Aerospace sector is **public procurement**. One example of a recent initiative is the CESAR programme in the framework of which the EU finances the development of new air-traffic management controls. With regard to harmonised regulation, there is a need of enhanced cooperation between the Member States. In addition, venture capital funding is missing. The panel strongly doubted that strong mobilisation of research workforce and human resources in general is achievable, even in the mid-term, due to **structural barriers** that exist (e.g. different salary pay scales across sectors, different salary structures across countries). Therefore, it was felt to be vital for the EC to start to establish a roadmap to lower these barriers. Aerospace sector is also hesitant about using intellectual property rights. In the opinion of many experts, obtaining the IPR is costly and time-consuming. Several companies do not patent in order to keep their know-how and not to diffuse it to their competitors. It appears that patents are not the main drivers of innovation in this sector. Also trademarks are rarely used.

Further to the success of European Aerospace industry (Airbus), Europe is also strongly investing in the field of Satellite Navigation Systems through the development of Galileo. **Galileo** is an initiative of the European Union, in collaboration with the European Space Agency and European Industry, to launch a European financed global satellite navigation system under civilian control. The satellite navigation market in Europe is rapidly expanding -

growing from just under a Billion Euro in 1999 to over 8 Billion Euro by 2005 alone. Current work aims to develop the architecture and design required to provide high precision navigation, position, timing and integrity information to meet both user needs and public obligations, such as safety for all transport modes. Galileo constitutes a case study of a lead market with rich market potential that needs to be efficiently developed for European competitiveness and welfare (see more in the annex).

G. THE CASE OF ECO-INNOVATION

There is not yet a generally accepted definition for Eco-innovation. The innovation panel on Eco-innovation suggested to define Eco-innovation as the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a life-cycle minimal use of natural resources (materials including energy and surface area) per unit output, and a minimal release of toxic substances. Following this definition, Eco-**industry** is the sector of industry that is pro-actively and demonstrably involved in eco-innovation, including novel solutions to satisfy legally set standards, norms and requirements.

Eco-innovations appear within -- or at the crossroads of – different sectors. Some leading principles of eco-efficiency, which are directly linked to eco-innovation such as resource efficiency, have **horizontal applications across different sectors**. However, eco-innovation for many analysts includes largely technologies related to energy efficiency and renewable energy sources (RES). Thanks to proactive energy policies RES have developed in certain countries a rapid deployment. In 2005 solar companies were the stars of the German stock market attracting huge investment. Public attention is also focused on wind power and photovoltaics which represent good examples for globally used technologies and innovations.

H. PUBLIC POLICY AND FAVOURABLE CONDITIONS: WHAT COULD BE RECOMMENDED?

According to the **"Aho" report**, "many elements for encouraging the development of lead markets are already in place, including relatively high incomes and a willingness to purchase higher quality goods. However, this is not enough - further steps need to be taken to":

- *Provide a harmonised regulatory environment across the EU favourable to innovation and based on early anticipation of needs;*
- *Use standards-setting powers to demand high technical performance levels and reach agreement on new standards quickly and efficiently;*
- *Use public procurement to drive demand for innovative goods, while at the same time improving the level of public services; and*
- *Foster a cultural shift which celebrates innovation and a desire to possess innovative goods and experience innovative services, such that Europe develops as a natural home for innovators.*

Therefore, a successful innovation policy strategy calls for more than higher expenditure of R&D. It also requires **improved coordination** between ministries and between different levels of government (including the EU), with the aim of providing industry and society with incentives for innovation. Although governments have only limited means for fostering market innovations, they significantly influence demand for advanced goods and services through shaping the business environment.

It is the role of the present workshop to discuss and identify the best way for intervention (or non-intervention) by the public sector to create favourable market conditions for leading edge technologies so that they can stimulate the emergence of new markets with high growth potential. For example, public demand is often too fragmented and not mobilised in a strategic and forward looking manner. This fragmentation and lack of future perspective is perceived by industry as a major weakness in Europe. It should be discussed how coordination and "bundling" of demand can be used to create markets of a critical size to incentivise innovation. On the other hand, "unbundling" may sometimes be necessary to create new opportunities for innovative SMEs to obtain manageable contracts. Public policy is therefore challenged in many different ways by the emergence of path breaking technologies and there is **no "silver bullet" to create lead markets**.

I. MAIN QUESTIONS FOR THE PARALLEL SESSIONS

A. Towards a better understanding of the concept of "Lead Markets"

- In which areas can policy make a difference, in which not?
- What are the main policy instruments available to create lead markets based on leading edge technologies?
- Which technologies are the most promising in this respect?
- What are the main barriers for transforming leading edge technologies in Space and Eco-innovation into new market opportunities?
- Who will benefit most from the creation of such lead markets? Has Europe a sufficient number of strong companies in Space and Eco innovation that could internationalise lead markets?
- What are the political risks of such a strategy?

B. Lead markets in strategic areas

- How can leading edge technologies be transformed into new markets?
- Which instruments have to be used for this purpose and how?
- What is the responsibility of market players, what the responsibility of policies?
- What about the financial implications and the political support for such lead markets strategy?
- What are the changes requested in the regulatory framework and standards? How do they affect trade? How could we produce world class standards that will lead the market?
- What are the main financial instruments or changes in financing policy that could the applied?
- How does the new paradigm for mobility, flexibility and adaptability of human resources applies to lead markets? What are the key success factors?
- How can Europe offer an innovation friendly environment for leading edge technologies to develop?
- How do we create demanding and novelty seeking customers in favour of a lead market?

- Do we have in Europe the lead users leading the lead markets in Space and Eco-innovation? Which national differences exist?
- How could public procurement be better synchronized to stimulate growth and establishment of lead markets and relevant technologies? What is the role of R&D?
- At which level should policies address the issues? Is there sufficient common sense in Europe to support the commercial exploitation of leading edge technologies in Space and Eco-innovation?

C. From practical experience to policy recommendations

- How have policies contributed in the areas of Space and Eco-innovation to the creation of lead markets? And where have such efforts failed?
- What concrete recommendations can be offered to policy makers at national and European level?
- What are the main sequence of actions and under which order that you will follow in order to establish a growing and healthy and promising lead market for space industry and eco-innovation benefiting other European Sectors as well?
- How should stakeholders be consulted to provide feedback on existing barriers to a better commercialisation of leading edge technologies in Space and Eco-innovation? Who are the main actors that could make a difference?
- What are the risks of such a strategy? What could be the potential benefits for Europe?

J. ANNEX

1. Galileo - European Satellite Navigation System

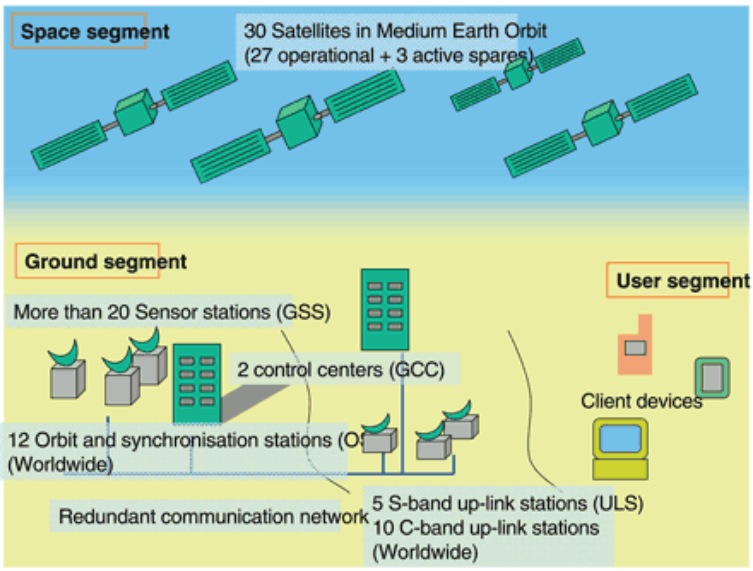
Europe is moving closer to the launch of its satellite navigation system Galileo. This will lead to a fully civilian controlled global satellite navigation system, with much improved navigation services and a certified positioning service. It will be fully compliant with ICAO's requirements for satellite navigation systems. The overall benefits include redundancy and integrity to meet the safety requirements of civil aviation and help the full introduction of satellite navigation for all phases of flight. Whilst the battle with GPS is likely to be bitter, in the end these two systems will benefit each other and massively extend the role of satellite navigation.

Galileo is an initiative of the European Union, in collaboration with the European Space Agency and European Industry, to launch a European financed global satellite navigation system under civilian control. The satellite navigation market in Europe is rapidly expanding - growing from just under a Billion Euro in 1999 to over 8 Billion Euro by 2005 alone. Current work aims to develop the architecture and design required to provide high precision navigation, position, timing and integrity information to meet both user needs and public obligations, such as safety for all transport modes.

Galileo is proposed as a Public Private Partnership formed between the European Union, ESA and a consortium of private companies. Galileo is also a part of the EU's wider strategic plan for space exploitation, which includes its programme for Global Monitoring, Environment and Security (GMES) - where 'security' also embraces safety - and is part of a joint strategy developed with ESA. The total cost of Galileo is expected to be around 3.5 Billion Euros.

The calculated benefits and the direct and indirect revenues from Galileo are expected to be substantial, fully justifying Europe's commitment. Galileo is very much a commercial initiative aimed at capturing a significant share of the satellite navigation market. It is not a flag waving exercise. The commercial, technical and market benefits have been carefully studied and laid out in very detailed market studies. As a result, civil aviation will be a major beneficiary of Galileo, although aviation is still only a very small percentage (around 1%) of the satellite navigation market.

The GALILEO architecture consists of three main segments: the Space Segment, Ground Segment, and User Segment (see figure 1).



2. Sectoral Innovation Watch: Main conclusions from the first Innovation Panel on Eco innovation

Despite the fact that there is no generally accepted definition or method of measuring eco-innovation, based on the Eco-innovation sectoral panel the following definitions were proposed:
- **Eco-innovation** is the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for everyone with a life-cycle minimal use of natural resources (materials including energy, and surface area) per unit output, and a minimal release of toxic substances.
- **Eco-industry** is the sector of industry that is pro-actively and demonstrably involved in eco-innovation, including novel solutions to satisfy legally set standards, norms and requirements.

Eco-innovations appear within -- or at the crossroads of – different sectors. Some leading principles of eco-efficiency, which are directly linked to eco-innovation such as resource efficiency, have horizontal applications across different sectors. Differentiation between high- and low-tech eco-innovations does not capture the essence of the issue, that is, the quality impact of eco-innovation. **Radical innovations**, especially those leading to a systemic change (system innovation), deserve the highest priority in innovation policy. **System innovations** can be shaped to a large extent by public policy. The initial focus should be on moving towards more integrated production processes and products leading to higher cost effectiveness (fewer resources, less labour, less energy) with the ultimate goal of promoting re-generative businesses that make a positive contribution to eco-systems. Integrating wind energy into regular energy supply grids was cited as an example of a system innovation needed in the energy sector. The panel suggested that developing a strategic policy vision and framework could funnel incremental changes to produce more radical systemic innovations.

The panel felt that the role of **regulation and standardisation** should be tackled with caution. It was underlined that regulation should not have the effect of fragmenting European markets.; that standardisation could be seen as a barrier for SMEs; and that the use of fiscal incentive systems could be more effective than more regulation.

In relation to **eco-culture**, it was underlined that consumer behaviour is shaped by incentives, mostly related to price and quality. There is a **need for a systemic incentive** to change this behaviour. Radical **fiscal adjustments** – shifting the tax burden from labour to resources – might be one solution. **Eco-innovation is aspirational** and often brought to the market in spite of normal market logic. In order to be sustainable, this behaviour needs to be supported by a system offering incentives and rewards for eco-innovators.

SMEs play a key role in developing innovative solutions related to eco-efficiency. EU innovation policy should support eco-innovative start-ups and spin-offs as a source of this type of sustainable and regenerative businesses. However, it is the large and highly consolidated industries, that have a large impact on the economy and natural resources that have the potential to bring about a systemic shift towards greater resource efficiency (decoupling). The important policy question here is how to link SMEs' attitudes and innovation potential to large actors.

Mobility of researchers in the eco-sphere is rather limited It was underlined that in many areas exchanges between academia and business are very limited. It is only when there is a need for some fundamental research i.e. in the case of development of novel technologies that mobility increases. Mobility between companies is higher and there is the potential for exchanges between environmental consultancies and policy-making institutions. There is evidence of increasing venture capital (VC) flows into alternative energy fields, mostly due to rising energy prices. This trend may become stronger in the future. Capital flows to the sector could be higher if eco-innovation was promoted as a factor in economic growth.

The development of learning capabilities is also a key capacity for environmental innovation and business growth, and can lead to breakthroughs in new products and processes as well as cost savings from energy efficiencies and radical increases in resource productivity. A compelling vision for the future

can provide a powerful driver for change, and because sustainability often aligns personal values with business objectives, people will often bring exceptional energy to the task.

Specific areas of applied research and eco-innovations

1. **bio-mimetics** - to design sympathetic technologies and to imitate nature in production processes
2. **nanotechnology** - innovative and eco-efficient materials
3. **biotechnology** – e.g. new methods of soil or water remediation (bio-remediation, water supply treatment)
4. **functional services** – e.g. self-cleaning surfaces, technologically based in the fields of new materials/nanotechnology, but with an impact on the service sector
5. **ICT** - huge eco-efficiency potential in terms of lowering resource intensity
6. **ICT for energy** - intelligence to satisfy demand with renewable energy plants (virtual power plants) and for levelling out demand and supply (smart grids)
7. **e-health** - involving environmental sensors and monitoring combined with electronics and medicine
8. **transport** – e.g. alternatives to aviation, short-trip transport developments, logistics and info-mobility (e.g. traffic control, smart traffic devices)
9. **materials pooling** could be a means towards sustainability
10. **service transition** towards **less-individualised level of service delivery** e.g. catering or laundry technologies could reduce the resource consumption of households and hotels
11. **easy access to environmental information** – developing information sources, applications and widgets providing information related to resource efficiency and energy consumption (e.g. at household, company, sector, country levels)
12. construction sector, especially **techniques and new materials**,
13. technologies to produce **fossil and carbon free energy**

3. Lead Markets of Environmental Innovations: A Framework for Innovation and Environmental Economics

The following summary is reproduced from the discussion paper: "Lead Markets of Environmental Innovations: A Framework for Innovation and Environmental Economics" by Marian Beise and Klaus Rennings (ZEW Centre for European Economic Research) The paper by the Centre for European Economic Research (ZEW) in Germany questions whether environmental regulations can create lead markets, enabling firms to export innovations that are induced by local market conditions and national regulations. Two case-studies are analysed: the emergence and international diffusion of wind energy generation and fuel efficient technologies for passenger cars.

Environmental regulations often want to stimulate the generation and adoption of eco-efficient innovations. An important argument in the public debate is also the creation of new markets for environmentally benign products, processes and services that other countries adopt and therefore generate export opportunities for the pioneering country. The research so far concentrated on the question how national environmental regulation can induce innovations. The question addressed in this paper is whether environmental regulations can create lead markets, enabling local firms to export innovations that are induced by local market conditions and national regulations. We identify relevant factors for lead markets of environmental innovations: price advantages, demand advantages, transfer advantages, export advantages and strict regulation (Porter-effect).

The approach is applied to two case studies: fuel-efficient passenger cars and wind energy. In both cases, one country adopted the innovation firstly. Later, other countries followed the same innovation design favoured by the lead market. The lead market became a large exporter in the wind generation and car industry respectively. We discuss the regulations employed and the reasons for the international success of the innovations induced by them.

We draw some conclusions concerning the relevance of our identified lead market factors for the two cases. Price advantages seem to be a relevant albeit not dominating driver of the international diffusion of the innovation in both cases. Demand advantages are crucial for the lead market of fuel-efficient cars since other criteria of global demand are still more important than environmental criteria. Transfer advantages can be identified in both cases since the R&D activities of the German automobile firms and the respective efforts of the Danish wind industry are intensively watched by other countries. Export advantages address the similarity of market conditions at home and abroad. They are more important in the wind energy case than for fuel-efficient cars. Finally the market structure or Porter effect has proved to be relevant in both cases. In the case of wind energy strict regulation, together with an anticipated regulatory trend as described above, can be seen as the dominating success factor for Denmark as a lead market. Without strict regulations and international policy diffusion renewable energies would not be competitive. For fuel efficient cars the Porter effect is less important since environmental regulation is to date still outweighed by consumer preferences that steer diametrically into the opposite direction.

Summing up, all lead market factors seem to be at least relevant for environmental innovations. The importance of the Porter effect depends on its relation to global demand and regulatory effects. If national regulation is supported by global demand or regulatory trends, a strong effect can be identified, as was shown in the cases of wind energy in Denmark and Diesel-High-pressure-direct-injection in Germany. If it is not supported, the market remains idiosyncratic, as could be seen in the failure of the Golf Ecomatic.